

AMENDMENTS TO THE CLAIMS

The following listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1-31 (Canceled).

Claim 32 (New): An electromagnetic actuator comprising:

a housing defining a cavity;

a solenoid coil disposed in the cavity of the housing, said solenoid coil having an axial passage extending therethrough and an outer periphery;

a shaft extending through the axial passage of the solenoid coil and having a longitudinal axis;

a clamp surface disposed in the cavity;

an armature secured to the shaft and extending outward from the shaft to an outer peripheral surface, which is disposed outward from the axial passage of the solenoid coil, said armature being movable between a first position disposed proximate to the clamp surface and a second position disposed distal to the clamp surface, wherein when the armature is in the first position, the armature and the housing define an outwardly-extending first gap therebetween, and when the armature is in the second position, the armature and the clamp surface define a longitudinally-extending second gap therebetween, said first gap having a width in a direction normal to the longitudinal axis of the shaft and said second gap having a width in the direction of the longitudinal axis of the shaft, and wherein the width of the second gap is greater than the width of the first gap; and

a permanent magnet disposed in the axial passage of the solenoid coil and operable to bias the armature toward the first position.

33. (New): The electromagnetic actuator of claim 32 further comprising a spring disposed in the cavity and operable to bias the armature toward the second position.

34. (New): The electromagnetic actuator of claim 32, wherein the housing does not enclose the armature.

35. (New): The electromagnetic actuator of claim 34, wherein the first gap is formed between the outer peripheral surface of the armature and an interior surface of the housing.

36. (New): The electromagnetic actuator of claim 34, wherein the first gap is formed between an inner surface of the armature and an exterior surface of the housing.

37. (New): The electromagnetic actuator of claim 36, wherein the clamp surface comprises an annular clamp plate partially disposed in the axial passage of the solenoid coil, above the permanent magnet.

38. (New): An electromagnetic actuator comprising:
a housing defining a cavity, said housing having an end wall;
a shaft at least partially disposed in the cavity of the housing and having a

longitudinal axis;

a clamp surface disposed in the cavity;

an armature secured to the shaft and extending outward from the shaft to an outer peripheral surface, said armature being movable between a first position disposed proximate to the clamp surface and a second position disposed distal to the clamp surface;

a solenoid coil disposed in the cavity of the housing between the end wall of the housing and the armature, said solenoid coil having first and second ends, an outer periphery and a center axis that is substantially coaxial with the longitudinal axis of the shaft, said first end of the solenoid being disposed distal from the end wall of the housing and said second end of the solenoid coil being disposed proximate to the end wall of the housing, said outer periphery being disposed inward from the outer peripheral surface of the armature; and

a permanent magnet fully disposed in the cavity and operable to bias the armature toward the first position, said permanent magnet being disposed proximate to the first end of the solenoid and distal to the second end of the solenoid; and

wherein when the armature is in the first position, the armature and the housing define an outwardly-extending first gap therebetween, said first gap having a width in a direction normal to the longitudinal axis of the shaft, wherein when the armature is in the second position, the armature and the clamp surface define a longitudinally-extending second gap therebetween, said second gap having a width in the direction of the longitudinal axis of the shaft, and wherein the width of the second gap is greater than the width of the first gap.

39. (New): The electromagnetic actuator of claim 38 further comprising a

spring disposed in the cavity and operable to bias the armature toward the second position.

40. (New): The electromagnetic actuator of claim 38, wherein the housing does not enclose the armature.

41. (New): The electromagnetic actuator of claim 40, wherein the first gap is formed between the outer peripheral surface of the armature and an interior surface of the housing.

42. (New): The electromagnetic actuator of claim 40, wherein the first gap is formed between an inner surface of the armature and an exterior surface of the housing.

43. (New): The electromagnetic actuator of claim 38, wherein the clamp surface comprises an annular clamp plate disposed above the permanent magnet.

44. (New): An electromagnetic actuator comprising:
a housing defining a cavity;
a shaft at least partially disposed in the cavity of the housing and having a longitudinal axis;
a solenoid coil disposed in the cavity of the housing, said solenoid coil having an outer periphery and a center axis that is substantially coaxial with the longitudinal axis of the shaft;
a clamp surface disposed in the cavity, toward the open end;

an armature at least partially disposed exterior to the housing, said armature being secured to the shaft and extending outward from the shaft to an outer peripheral surface, which is disposed outward from the outer periphery of the solenoid coil, said armature being movable between a first position disposed proximate to the clamp surface and a second position disposed distal to the clamp surface, wherein when the armature is in the first position, the armature and the housing define an outwardly-extending first gap therebetween, said first gap having a width in a direction normal to the longitudinal axis of the shaft, wherein when the armature is in the second position, the armature and the clamp surface define a longitudinally-extending second gap therebetween, said second gap having a width in the direction of the longitudinal axis of the shaft, and wherein the width of the second gap is greater than the width of the first gap; and

a spring disposed in the cavity and operable to bias the armature toward the second position.

45. (New): The electromagnetic actuator of claim 44, wherein the first gap is formed between the outer peripheral surface of the armature and an interior surface of the housing.

46. (New): The electromagnetic actuator of claim 45, wherein the first gap has a plurality of different widths in the direction normal to the longitudinal axis of the shaft.

47. (New): The electromagnetic actuator of claim 44, wherein the first gap is formed between an inner surface of the armature and an exterior surface of the

housing.

48. (New): The electromagnetic actuator of claim 44, wherein the solenoid coil has an axial passage extending therethrough and wherein the clamp surface comprises an annular clamp plate partially disposed in the axial passage.

49. (New): The electromagnetic actuator of claim 48, further comprising a permanent magnetic disposed in the axial passage of the solenoid coil, below the clamp plate.